

CLAIMS

1. A radio reception system capable of receiving signals from a plurality of users using a plurality of antennas, comprising:

5 signal processing means for performing a prescribed signal processing on the signals received by said plurality of antennas;

 a plurality of first signal extracting means for extracting signal components corresponding to said plurality of users, respectively, based on a signal output from said signal processing means;

10 a plurality of first estimating means for estimating parameter information related to relation between the signal components extracted by said first signal extracting means and the signal output from said signal processing means;

15 a plurality of first error determining means for determining whether the signal components corresponding to the plurality of users extracted by said first signal extracting means include a demodulation error or not, respectively; and

 first operating means for subtracting, from the signal output from said signal processing means, said extracted signal component determined by said first error determining means not to include any demodulation error, in consideration of corresponding said parameter information.

25 2. The radio reception system according to claim 1, further comprising

 a plurality of second signal extracting means for extracting, based on the signal output from said first operating means, signal components corresponding to users determined by said first error determining means to include a demodulation error, respectively;

30 a plurality of second estimating means for estimating parameter information related to relation between the signal components extracted by said second signal extracting means and the signal output from said first operating means; and

 a plurality of second error determining means for determining

whether the signal components extracted by said second signal extracting means include a demodulation error or not, respectively.

3. The radio reception system according to claim 2, further
5 comprising

second operating means for subtracting, from the signal output from said signal processing means, the signal component extracted by said first and second signal extracting means determined by said first and second error determining means not to include any demodulation error, in
10 consideration of corresponding said parameter information.

4. The radio reception system according to claim 2, further comprising

third operating means subtracting, from the signal output from said first operating means, the signal component extracted by said second signal extracting means determined by said second error determining means not to include any demodulation error, in consideration of corresponding said parameter information.
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20 5. A radio reception system capable of receiving signals from a plurality of users using a plurality of antennas, comprising:

signal processing means for performing a prescribed signal processing on the signals received by said plurality of antennas;

25 a plurality of first signal extracting means for extracting signal components corresponding to said plurality of users, respectively, based on a signal output from said signal processing means;

30 a plurality of first estimating means for estimating parameter information related to relation between the signal components extracted by said first signal extracting means and the signal output from said signal processing means based on a correlation value between signal component of the corresponding user and signal component of another user;

a plurality of first error determination means for determining whether the signal components corresponding to the plurality of users

extracted by said first signal extracting means include a demodulation error or not, respectively; and

5 first operating means for subtracting, from the signal output from said signal processing means, said extracted signal component determined by said first error determining means not to include any demodulation error, in consideration of corresponding said parameter information.

6. The radio reception system according to claim 5, further comprising

10 a plurality of second signal extracting means for extracting, based on the signal output from said first operating means, signal components corresponding to users determined by said first error determining means to include a demodulation error, respectively;

15 a plurality of second estimating means for estimating parameter information related to relation between the signal components extracted by said second signal extracting means and the signal output from said first operating means based on a correlation value between signal component of the corresponding user and signal component of another user; and

20 a plurality of second error determining means for determining whether the signal components extracted by said second signal extracting means include a demodulation error or not, respectively.

7. The radio reception system according to claim 6, further comprising

25 second operating means for subtracting, from the signal output from said signal processing means, the signal component extracted by said first and second signal extracting means determined by said first and second error determining means not to include any demodulation error, in consideration of corresponding said parameter information.

30 8. The radio reception system according to claim 6, further comprising

third operating means subtracting, from the signal output from said

first operating means, the signal component extracted by said second signal extracting means determined by said second error determining means not to include any demodulation error, in consideration of corresponding said parameter information.

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9. The radio reception system according to any of claims 5 to 8, wherein

10 said plurality of first estimating means estimate said parameter information by calculating said correlation value, independent from result of determination by said plurality of first error determination means.

10. The radio reception system according to any of claims 5 to 8, wherein

15 said plurality of first estimating means estimate said parameter information by calculating said correlation value using signal components of the users determined not to include any demodulation error, based on the result of determination by said plurality of first error determining means.

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11. The radio reception system according to any of claims 6 to 8, wherein

25 said plurality of second estimating means estimate said parameter information by calculating said correlation value, independent from result of determination by said plurality of second error determination means.

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12. The radio reception system according to any of claims 6 to 8, wherein

30 said plurality of second estimating means estimate said parameter information by calculating said correlation value using signal components of the users determined not to include any demodulation error, based on the result of determination by said plurality of second error determining means.

13. A radio reception system capable of receiving signals from a plurality of users using a plurality of antennas, comprising:

5 signal processing means for performing a prescribed signal processing on the signals received by said plurality of antennas; and

one stage of interference cancellers, including

10 a plurality of stages of interference removing units corresponding to said plurality of users; wherein

each stage of said interference removing unit includes

15 signal extracting means for extracting signal component corresponding to a specific user, different stage by stage, among said plurality of users based on an input signal,

estimating means for estimating parameter information related to relation between the signal component extracted by said signal extracting means and the signal input to said signal extracting means,

20 operating means for removing the signal component corresponding to said specific user, from the signal input to said signal extracting means in consideration of said parameter information, and

error determining means for determining whether the signal component corresponding to said specific user includes a demodulation error or not, and when determined to include the demodulation error, disabling removal of the signal component corresponding to said specific user by said operating means; and

25 said plurality of stages of interference removing units are connected such that the signal output from said signal processing means is input to inputs of said operating means and said signal extracting means of the first stage of said interference removing units, and an output of said operating means of a former stage interference removing unit of adjacent two interference removing units is applied to inputs of said signal extracting means and said operating means of a latter stage interference removing unit.

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14. The radio reception system according to claim 13, further comprising

1 a next stage of interference cancellers receiving an output of said
2 operating means of a last stage interference removing unit of said one stage
3 of interference cancellers; wherein
4 said next stage interference canceller includes a plurality of stages of
5 interference removing units corresponding to said plurality of users;
6 each stage of said interference removing units includes
7 signal extracting means for extracting and outputting signal
8 component corresponding to a specific user, different stage by stage, among
9 said plurality of users, based on an input signal,
10 estimating means for estimating parameter information related to
11 relation between the signal component extracted by said signal extracting
12 means and the signal input to said signal extracting means,
13 operating means for removing the signal component corresponding to
14 said specific user from the signals input to said signal extracting means, in
15 consideration of said parameter information, and
16 error determining means for determining whether the signal
17 component corresponding to said specific user includes a demodulation
18 error or not and, when determined to include an error, disabling removal of
19 the signal component corresponding to said specific user by said operating
20 means;
21 the interference removing unit of said next stage interference
22 canceller corresponding to a user determined not to include any
23 demodulation error by the interference canceller of said first stage provides
24 an output of the interference removing unit of the preceding stage as it is to
25 the interference removing unit of the succeeding stage; and
26 in the interference removing unit of said next stage interference
27 canceller corresponding to the user determined to include a demodulation
28 error by said first stage interference canceller, an output of the interference
29 removing unit of the preceding stage is applied to inputs of said signal
30 extracting means and said operating means, and an output of said
31 operating means is output to the interference removing unit of the
32 succeeding stage.

15. A radio reception system capable of receiving signals from a plurality of users using a plurality of antennas, comprising:
signal processing means for performing a prescribed signal processing on the signals received by said plurality of antennas; and
5 one stage of interference cancellers;
said one stage of interference canceller includes a plurality of stages of interference removing units corresponding to said plurality of users;
each stage of said interference removing units includes
10 signal extracting means for extracting and outputting signal component corresponding to a specific user, different stage by stage, among said plurality of users, based on an input signal,
estimating means for estimating, based on a correlation value between signal component of said specific user and signal component of another user, parameter information related to relation between the signal component extracted by said signal extracting means and the signal output
15 from said signal processing means,
error determining means for determining whether the signal component corresponding to said specific user includes a demodulation error or not, and
20 operating means for removing the signal component corresponding to a user determined not to include a demodulation error from the signal output from said signal processing means, in consideration of said parameter information; and
25 said plurality of stages of interference removing units are connected such that the signal output from said signal processing means is input to inputs of said operating means and said signal extracting means of the first stage of said interference removing units, and an output of said operating means of a former interference removing unit of adjacent two interference removing units is applied to an input of said signal extracting means of a
30 latter stage interference removing unit.

16. The radio reception system according to claim 15, further comprising

a next stage of interference cancellers receiving an output of said operating means of the interference removing unit of the last stage of said one stage of interference cancellers; wherein

5 said next stage interference canceller includes a plurality of stages of interference removing units corresponding to said plurality of users;

10 each stage of said interference removing unit includes signal extracting means for extracting and outputting signal component corresponding to a specific user, different stage by stage, among said plurality of users based on an input signal,

15 estimating means for estimating, based on a correlation value between signal component of said specific user and signal component of another user, parameter information related to relation between the signal component extracted by said signal extracting means and the signal output from said signal processing means,

20 error determining means for determining whether or not the signal component corresponding to said specific user includes a demodulation error, and

25 operating means for removing the signal component corresponding to the user determined not to include any demodulation error from the signal output from said signal processing means, in consideration of said parameter information;

30 the interference removing unit of said next stage interference canceller corresponding to the user determined not to include any demodulation error by said first stage interference canceller outputs an output of the interference removing unit of the preceding stage as it is to an interference removing unit of the succeeding stage; and

 in the interference removing unit of said next stage interference canceller corresponding to the user determined to include a demodulation error by said first stage interference canceller, an output of the interference removing unit of the preceding stage is applied to an input of said signal extracting means, and an output of said operating means is output to the interference removing unit of the succeeding stage.

17. The radio reception system according to any of claims 13 to 16, wherein

5 said estimating means calculates correlation value between the signal component of said specific user and signal component of another user independent from result of determination by said error determining means, and estimates said parameter information based on the calculated correlation value.

10 18. The radio reception system according to any of claims 13 to 16, wherein

15 said estimating means calculates the correlation value using only the signal components of the users determined not to include any demodulation error based on the result of determination by said error determining means, and estimates said parameter information based on the calculated correlation value.

19. The radio reception system according to claim 1, 5, 13 or 15, wherein

20 said signal extracting means is an adaptive array spatially separating and extracting signal component corresponding to a specific user.

25 20. The radio reception system according to claim 1, 5, 13 or 15, wherein

20 said signal extracting means includes an adaptive array spatially separating and extracting signal component corresponding to a specific user,

25 a demodulator demodulating an output of said adaptive array, and a re-modulator re-modulating an output of said demodulator.

30 21. The radio reception system according to claim 1, 5, 13 or 15, wherein

20 the signals from said plurality of users are signals transmitted in accordance with PDMA communication method.

22. The radio reception system according to claim 1, 5, 13 or 15,
wherein

5 the signals from said plurality of users are signals transmitted in
accordance with CDMA communication method.

23. The radio reception system according to claim 22, wherein
10 the signals transmitted in accordance with said CDMA
communication method are spread by predetermined spreading codes in
advance on a transmitting side,

15 said system further comprising
inverse spreading means for inverse spreading signals output from
said signal processing means by corresponding spreading codes in
accordance with CDMA communication method and applying the results to
said signal extracting means.